

ORIGINAL ARTICLE**MALAYSIAN OIL PALM WORKERS ARE IN PAIN: HAZARDS IDENTIFICATION AND ERGONOMICS RELATED PROBLEMS**

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ABSTRACT

Agricultural activities have always been associated with hazards and injuries. Most common injuries experienced by workers are health, safety and ergonomic injuries. It stems from many causes, such as the use of manual tools, incorrect working position, inadequate rest and overloading. This paper aims to reveal the daily hazardous work task of oil palm plantation workers with highlighting the ergonomics problems and risk of injury they faced. Observations of work tasks and distribution of Modified Nordic Questionnaire (MNQ) were performed for every work unit. Worker's activities and posture while performing work tasks were recorded extensively using camera and video recordings for ergonomics analysis. Results from the observation and questionnaire survey conducted, showed that oil palm plantation workers are exposed to the risk of dangerous work every day. Fresh fruit bunches cutter and loose fruit collectors were having highest body pain complaints and almost from them are having low back pain problems. Therefore, it is necessary for an immediate action from the management in order to determine the current prevalence of ergonomic injuries. Using of manual tools should be avoided and plantation workers should be provided with ergonomics machines that can help them reduce their workload and injuries.

Keywords: Ergonomics, Hazards, Safety and Health, Oil Palm Plantation, Malaysia

INTRODUCTION

Agriculture is one of the earliest industries explored and implemented in Malaysia. However, this industry still maintained traditional or manual work system^{1,2}. Dependence on farm worker labor force is very high compared to other industries³. Agriculture workers are exposed to ergonomics problems in their routine works⁴. Apart from rubber and rice, palm oil is also a major agricultural sector commodity that contributes 37% to Gross Domestic Product (GDP)⁵. Oil palm harvesters are not spared from being exposed to various ergonomics risk factors that leading to musculoskeletal disorders^{6,7,8}. About 11.5% of Malaysian populations are employed in this sector. Meanwhile, the majority of oil palm plantation workers are men and they are foreign from Indonesia, Myanmar and Bangladesh.

Generally, the major daily work done by oil palm plantation workers are cutting fresh fruit bunches (FFBs), collecting, loading and unloading FFBs to be sent to the processing plant⁹. Therefore, due to the nature of the task requirement, ergonomics problems and hazardous task are unavoidable¹⁰. In the workplace, workers are exposed to various hazardous tasks, such as physical hazards,

chemical hazards, biological and others¹¹. According to the context of the study, hazardous task suffered by oil palm plantation workers are closely related to ergonomic hazards. An ergonomic hazard is caused by the force exerted on the body or body position while doing work. It can cause short term or long term exposure to the workers, such as frequent lifting, poor posture, repetition and others¹¹. From previous studies, it can be concluded that the ergonomic hazard can be categorize into two (as Figure 1) which are physical injury and ill health^{11,12}. Physical injury normally associated with tools and machinery while ill health related with human body.

Without carefully manage the problems, each worker has a high tendency to suffer from musculoskeletal problems¹³. It is supported by recent trends which have shown that work related musculoskeletal disorders (WMSDs) and compensation costs for this type of injuries are on the rise in many industries¹⁴. A report made by Social Security Organization (SOCO), showed the Malaysian government spends billions of Ringgit Malaysia each year, for solving workers' compensation claims¹⁵. It is believed there any

many cases that have not been reported due to several factors such as they do not know how to claim compensation¹⁶.

This should not happen because the oil palm plantation workers is a catalyst for the development of the country¹⁷ and they contributed significantly to the upgrading of the national economy. The causes of the accidents and health problems should be dealt with promptly.

Management is responsible for helping to find out on how to ease the burden on workers. Thus, the two main objective of this paper are to identify hazardous and ergonomics related problems faced by oil palm plantation workers. Body parts that are experiencing illness or injury as a result of routine work are also being identified. Findings of this study can provide useful information to management and other researchers to assist oil palm plantation workers.

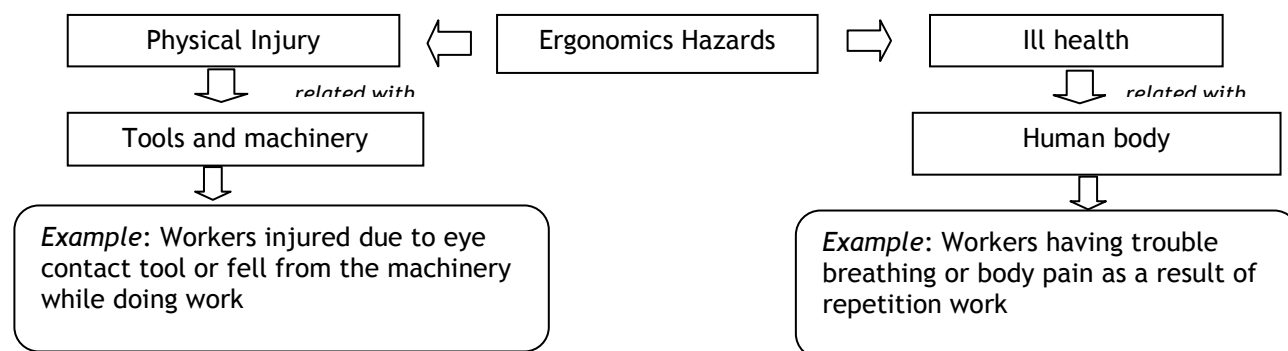


Figure 1 Ergonomics Hazards Chart Oil Palm Workers

METHODS

This cross-sectional study was conducted in an oil palm plantation situated at Negeri Sembilan, Malaysia. This study was carried out by using two methods, namely observation at the work site and respondents answer for survey questions.

Questionnaire

Distribution of questionnaire session was done at the farm management office. All workers voluntarily participated in the session. The respondents were asked to fill up the subjective evaluation form to evaluate their perceptions on discomfort they experienced and personal information. The first part of the questionnaire comprise of demographic information such as age, height, weight, working experiences and medical information. The second part of questionnaire contains body part score survey information. It is to determine body part which experienced pain by workers as a result from their daily work routine. The questions used was based on Nordic Musculoskeletal Questionnaire (NMQ) published by Kuorinka *et al.*¹⁸. To complete the survey form, each respondent was aided with a body map to indicate which body part is affected by discomfort feeling due to the work activity.

Field Observation

Observation is probably the most often used approach to identify risk and hazards at work. Daily work activities of every worker were

observed. The oil palm plantation workers need to perform their work activities as usual. All the activities were recorded using a video camera. This was done to ensure the actual activities were captured so that the ergonomic risk assessment can be rechecked and can be reevaluated in the laboratory. In addition, typical problematic postures performed by the oil palm plantation workers can be easily analyzed and addressed. Validity of field observation will be confirmed through cross checking with the results of questionnaire.

RESULTS

Demographic Data

The total number of respondents is 88 oil palm workers and they are all male. Workers aged between 18-50 years with the highest frequency are 28 years of age and standard deviation of 6.5. Their weight ranges between 40-70 kilogram with standard deviation 6.27 and height between 130-180 centimeters with standard deviation 9.52. All of the oil palm workers are foreigners and a large majority is from Indonesia. A total of 58 people are married, 29 are single and 1 widower. In addition, majority oil palm workers are educated up to primary school, 36.4%, lower secondary school, 19.3% and only 15.9% of workers who have education up to high school. Oil palm workers who never went to school are at 28.4%. Number of workers involved in this study in different scope of work varies. The highest number of respondents work as cutter (33 respondents), followed by loose

fruit collector (32 respondents), frond stacker (11 respondents), driver of mechanical buffalo (5 respondents) and driver of mini truck grabber (7 respondents).

Observation

Observational methods are probably the most often used approach to identify hazards, assessment and control of the risk¹⁹. Based on the observations in oil palm plantations, daily work of oil palm workers is divided into four main work tasks, which are; harvesting FFBs, collecting FFB, collecting loose fruit and crop care. Some dangerous and risky tasks to the workers have been identified and shown in Figure 2, 3 4, 5, 6, 7 and 8.

Task 1: Managing Harvesting

a) Harvesting FFB

FFB cutting activities was performed daily. FFB should be cut as soon as possible to avoid a reduction in the value of oil. Oil palm workers using chisel for low oil palm trees and sickle for tall trees. A fruit can weight at an average of about 10 kg. Manual cutting of FFB is tough job.



Figure 2 Harvesters cut FFB using chisel and sickle

Harvesters carrying a long and sharp chisel or sickle while walking from tree to tree to cut FFB. They always looked up during harvesting. Extreme neck and trunk flexion are normal during harvesting activity for tall trees. To cut fruit, knees and body is bending over while hand holding and pushing long-armed sickle firmly. Harvesters have very high level exposure at the neck and shoulder. It can be seen that harvester's back posture is in precise position. If the harvester continuously performs this job by using manual tool, it will increase the risk of getting injured.

b) Cut-off fruit stalk and frond

After FFB been cut and dropped from the trees, different oil palm workers would come and cut the fruit stalks. The stalks should be removed before being collected by machinery collectors. Fruit stalk is considered as waste because it can reduce the quality of oil palm. Apart from cutting the fruit stalk, the same oil palm workers also perform activities such as cutting and stacking palm fronds.

Palm fronds have to be cut and arranged to facilitate the easy movement of oil palm collector.



Figure 3 Oil palm worker cut fruit stalk and palm fronds

Oil palm workers bend his body to cut the fruit stalk. After that, oil palm workers grouping the FFB by raise up using an axe. Legs and body in a state bent to lift heavy loads. The same oil palm workers also cut the fronds of palm trees. They are exposed to risk of injury from the thorny fronds. The oil palm workers are exposed to danger cut and lift the fronds heavy workload and also bending working posture. They are fully utilize the energy with the help of manual equipment, an axe.

Task 2: Collecting Fresh Fruit Bunches (FFB)

a) Mini Tractor Grabber (MTG)

To collect the FFB harvested, oil palm workers were assisted by MTG and mechanical buffalo. MTG is used for areas that are not hilly and easy to access. Mini Tractor Grabber (MTG) also known as KUBOTA. Capacity: 1.5 ton or 2 ton.



Figure 4 Worker using MTG to collect FFB

MTG helps to ease the driver's burden. However, they are still exposed to ergonomic problems such as the drivers need to look back frequently, every time the machine is lifting FFB from ground into carts. Extreme neck rotation was found to be the highest ergonomic risk while performing this task.

b) Mechanical Buffalo/Badang

Mechanical buffalo (MB) or known as 'Badang' is used to collect FFB in the hilly terrain and uneven ground. Its capacity is smaller than MTG, about 0.5ton. Workers need to descend from the

machine to lift the FFB using 'iron chock' and put into the Badang's cart.



Figure 5 Mechanical Buffalo for collect FFB at hilly area

Fruit collector hunchback body and legs while both hands firmly gripping 'iron chock'. Fruit collector using high energy to collect FFB from the ground into Badang's cart. This machine is not ergonomically design in terms of engine vibration because the engine has quite strong vibrations and noisy. It may expose a risk to workers if used on a regular basis over a long period.

Task 3: Managing Loose Fruit

a) Collecting Loose Fruits

FFB fruit that falls on the ground must leave the loose fruit. The loose fruits should be collected because it still has value to be processed. Moreover, if it is not collected, eventually it will grow into new fruit trees. Uncontrollable new plant growth will cause the existing palm trees will be stunted because of resource sharing. Loose fruits will be collected using a wheelbarrow, rack and broom.



Figure 6 Stooping and Squatting during collecting loose fruits activity

FFB collectors are bending their body and sweeping loose fruits. Bending and stooping are

the common posture used to perform this task. FFB collectors are at risk of extreme back pain resulting from squatting. Loose fruits that have been collected will be put into sacks. Once completed, the FFB collectors will walk into another tree while pushing a wheelbarrow. Pushing the wheelbarrow with load of loose fruit is another risky activity.

Task 4: Crop Care

a) Manuring or Fertilization

Fertilization activities are done on daily basis according to designated area that has been scheduled. Fertilizers are distributed by using a lorry. This work activity is fully utilizing human energy. There are no technologies or tool used to help in easing the workload.



Figure 7 Fertilization activity manually

The fertilizer with weight of 50kilogram per bag is transferred from lorry to fertilizer loader. Two workers are responsible to carry the bag to the fertilizer loader on the ground. The loader carry the fertilizer on his shoulder and another loader spread to surrounding areas which have been set. During manuring process, 2 workers involved at one time. (1) To carry fertilizer in a large bag. Oil palm worker bending his body to bear a heavy burden on his shoulders. (2) To spread smaller quantity of fertilizer onto specific location. This work is carried out repeatedly and will pose a risk on the hands and arms of oil palm workers.

b) Weeding and Pest Control

Spraying activities have been done to avoid plants that are not supposed to be grow around oil palm trees.



Figure 8 Worker carry heavy load during weeding

After filling liquid herbicide, workers close the container thoroughly to avoid spills. The worker is seen bending his body parts to carry the load at the back of his body. Workers were carrying plastic container containing of weed killer. Workers carry the container on their shoulder and back of his body while his hands pointing nozzles to spray weed killer into the surrounding area. During spraying, the oil palm worker's hands are always holding the nozzle and pointing to the left and right direction and also pointing towards the grass that grows around the area the oil palm trees.

Body Pain

In general, oil workers were asked if they are experiencing pain in any part of their body due to their daily working activities. Generally, most of the workers have experienced pain due to their heavy work load. However, they may differ in terms of frequency of pain and pain level. From the results of this study, there are 5 work units at oil palm plantation; fruit cutter, frond stacker, loose fruit collector, MTG drive and Badang driver. The pain experienced by oil palm workers

according to work units is show in Table 1. FFB cutter and loose fruit collectors were having highest body pain which is 37.5 and 36.36 percent (refer Table 1). This is followed by frond stacker (12.5 percent), MTG driver (7.95 percent) and Badang driver (5.68 percent).

Nevertheless, body pain experienced by the oil palm workers frequently happened but it is still in control. Table 2 shows overall workers' complaint on pain in general body area. Results from the Nordic survey carried out, shows majority of the oil palm workers are not suffering from frequent pain. However, about 15 % of workers reported they are experiencing pain regularly and 12 % always in pain caused by daily work.

From the result of NMQ body part pain survey, the body part which has the highest complaint is lower back at 99% (refer to Figure 9). It is followed by upper back (85%), shoulder (77%), buttock (81%), neck (74%), calf (71%), arm (58%), knee (56%), thigh (52%), wrist (46%), finger (40%), ankle (38%) and foot print (34%) respectively.

Table 1 Pain experienced by workers according to the type of work

Work Unit	Body Pain			Total	
	Sometimes in pain	Frequent in pain	Always in pain	n	%
Cutter	21	6	6	33	37.5%
Frond Stacker	8	3	0	11	12.5%
Loose fruit collector	25	2	5	32	36.36%
MTG Truck driver	6	1	0	7	7.95%
Badang Driver	4	1	0	5	5.68%

Table 2 Overall oil palm workers' complaint on pain in general body area

Pain in general	No of Cases	Percentage (%)
Sometimes in pain	64	73
Frequent in pain	13	15
Always in pain	11	12

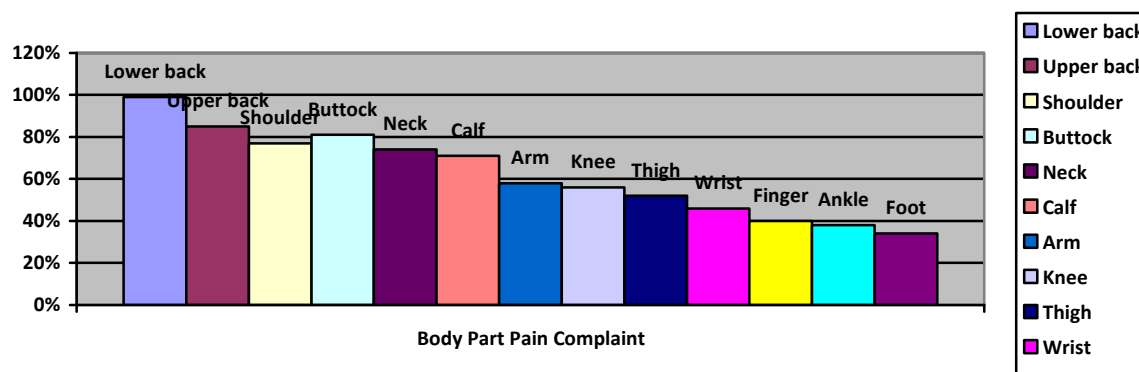


Figure 9 Overall oil palm workers' complaint on pain in general body area

Analysis of body part pain according to each work unit in oil palm plantations (refer to Table 3) found that almost all workers are having low back pain problems. For FFB cutter, apart from the problem of low back pain, they also faced the pain on the upper back, neck and shoulders. Meanwhile, frond stackers are facing

severe body pain in the shoulder and upper back. Loose fruit collectors faced body pain problems on the calves, knees, buttocks and upper back. 'Badang' driver is facing body pain in the shoulder and upper back. Meanwhile, MTG driver is having body pain in the neck, shoulder and buttock.

Table 4 Body Parts Pain based on Work Units

Body Parts / Work Units	Cutter	%	Frond Stacker	%	Loose Fruit Collector	%	Badang Driver	%	MTG truck Driver	%
Neck	32	36.4	5	5.7	19	21.6	2	2.3	7	8.0
Shoulder (Right)	30	34.1	9	10.2	21	23.9	5	5.7	6	6.8
Shoulder (Left)	29	33.0	9	10.2	20	22.7	5	5.7	7	8.0
Elbow (Right)	15	17.0	3	3.4	16	18.2	2	2.3	3	3.4
Elbow (Left)	12	13.6	3	3.4	14	15.9	2	2.3	3	3.4
Upper Back	31	35.2	9	10.2	24	27.3	5	5.7	6	6.8
Lower Back	33	37.5	10	11.4	32	36.4	5	5.7	7	8.0
Finger (Right)	13	14.8	2	2.3	16	18.2	1	1.1	3	3.4
Finger (Left)	12	13.6	2	2.3	16	18.2	1	1.1	3	3.4
Upper Arm (Right)	24	27.3	5	5.7	14	15.9	3	3.4	5	5.7
Upper Arm (Left)	22	25.0	4	4.5	14	15.9	4	4.5	5	5.7
Lower Arm (Right)	16	18.2	2	2.3	15	17.0	2	2.3	5	5.7
Lower Arm (Left)	15	17.0	2	2.3	16	18.2	2	2.3	5	5.7
Wrist	17	19.3	3	3.4	16	18.2	2	2.3	3	3.4
Ankle (Right)	10	11.4	2	2.3	16	18.2	1	1.1	5	5.7
Ankle (Left)	10	11.4	2	2.3	16	18.2	1	1.1	5	5.7
Buttock (Right)	25	28.4	7	8.0	25	28.4	4	4.5	7	8.0
Buttock (Left)	24	27.3	7	8.0	25	28.4	4	4.5	7	8.0
Knee (Right)	14	15.9	4	4.5	24	27.3	2	2.3	5	5.7
Knee (Left)	14	15.9	4	4.5	25	28.4	2	2.3	5	5.7
Calf (Right)	23	26.1	4	4.5	29	33.0	2	2.3	5	5.7
Calf (Left)	23	26.1	4	4.5	29	33.0	2	2.3	5	5.7
Foot print (Right)	11	12.5	3	3.4	10	11.4	1	1.1	4	4.5
Foot print (Left)	12	13.6	3	3.4	10	11.4	1	1.1	4	4.5
Thigh (Right)	13	14.8	4	4.5	21	23.9	3	3.4	5	5.7
Thigh (Left)	13	14.8	4	4.5	21	23.9	3	3.4	5	5.7

DISCUSSION

This study proved that the entire work units in oil palm plantations have exposed their workers to hazardous and risky tasks. Every day the workers are confronted with the risk of injuries and accidents. The findings indicated that majority of workers are facing the problem of low back pain. They expose with awkward postures most of their working times. This adds further complexity on the problem of workers' health. The use of manual tools every day and in a long term would cause the workers having increasingly body illness^{21,22}. Therefore, they need very high physical strengths to perform their daily work activities. Several major ergonomic risks factors were found during performing working activities such as high repetitive wrists and hands movements, awkward hand and body postures during cutting and carrying of FFB and long working hours with short rest periods. Effect of exposure to the ergonomics risk factors, workers has tendency to suffer from musculoskeletal problems^{15,20}.

The use of manual tools is still a norm and become a necessity for them. These oil palm workers prefer traditional tools than the current machinery technology. However, there is also a work unit assisted by the latest machinery technology which is FFB collector. Fresh Fruit Bunches (FFBs) collector is no longer using manual tools such as wheelbarrows due to the existence of MTG and Mechanical Buffalo machines which help lighten their workload. Yet, the result of the study had also identified that; the technology has also led to body pain and injury. Body pain experienced is not much difference with the workers using fully manual tools. So it becomes an issue why we need to use the technology if it gives more health and safety risks. This should not happen because the purpose of tools being developed is to help and take care of the health and safety of the workers²³. After investigation made during field observation, it was found that the machines technology does not have an ergonomic design such as vibration and noisy machinery give an impact to the workers. A good machine technology should take into account the inter-relationship between human and machine²⁴.

CONCLUSION

Agricultural industry is among one of the industries that involved with various types of hazardous work. Some types of ergonomics hazards that have been identified experienced by oil palm plantation workers are manual material handling, awkward postures, repetitive works, heavy load, excessive force and not using ergonomics tools. The results

suggest that the workers need to be provided with proper working techniques and replace manual tools with ergonomics machined tools. There are a number of new machine tools that have been adopted by organization for oil palm plantation workers. However, it is still not fully utilized. Oil palm workers still have body pain problems even with the use of these machines. Further study of the aspects of human and environmental factors is needed. Issues related to human factors need to be resolved quickly because it can reduce accident rates and health problems of workers and simultaneously it can enhance work productivity. Overall, it need of effective intervention to improve work task and environment.

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